NH Volunteer River Assessment Program

Water Quality Monitoring Sampling Protocols for Volunteer Monitors

Station 01X-OTB – Otter Brook Roxbury, NH Photo Credit: Tanya Dyson

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INTRODUCTION

The Volunteer River Assessment Program (VRAP) is a program administered by the New Hampshire Department of Environmental Services (NHDES) that partners with volunteers to conduct water quality monitoring of New Hampshire's rivers and streams. Our rivers and streams receive drainage from watersheds that vary greatly in size, land-cover type, and levels of human activity. This creates diverse ambient surface water quality conditions throughout the state. These varying conditions have implications for the support of designated uses such as primary contact recreation (swimming) and the health of aquatic life. The ability of rivers and streams to support designated uses is measured through the VRAP relative to New Hampshire's surface water quality standards.

VRAP volunteers assess the physical, chemical and biological characteristics of the rivers and streams throughout the state. The data collected by volunteers is reported to NHDES and is evaluated by making comparisons to water quality standards and by making comparisons to established means and ranges of water quality throughout the state. The data collected by VRAP is used by NHDES for water quality assessment, education, and reporting purposes. The data are used by volunteer monitors for educational purposes, for guiding management and restoration efforts, and also for local watershed management.

New Hampshire has over 16,000 miles of rivers and streams and it is far beyond the capacity of NHDES to monitoring all of these waterbodies. VRAP was initiated in 1998 as a collaboration between NHDES and citizen scientists who are trained in water quality monitoring procedures to collect high quality data. Over 40% of the surface water quality assessments of riverine assessment units NHDES included in its 2014 Clean Water Act assessments were provided by the VRAP program.

These water quality monitoring protocols are intended as a guide to VRAP volunteers for all of the activities associated with water quality monitoring including how to operate water quality monitoring equipment, proper QA/QC procedures, processing of laboratory samples, sampling techniques, and safety in the field.

SAFETY IN THE FIELD

Safety is the first priority while conducting river and stream field monitoring. Please take note of the following safety precautions and if at any point, you feel uncomfortable, please terminate monitoring immediately.

- Always monitor with at least one other person. Never sample in the field without a partner.
- Look at the weather forecast before sampling, making sure no storms are approaching or flood warnings are in effect.
- Avoid wading into a river if the water is high or fast moving. In these conditions, sample from a bridge or from the shore.
- Do not enter water above your waist and be sure someone on shore knows where you are at all times.

In- Stream Safety

When it is necessary to wade into a stream to collect water samples:

1. Do not enter flowing water that is above your waist and be sure someone on shore knows where you are.
2. Always wear waders or waterproof wading boots
3. Secure your footing with each step. River bottoms accumulate slippery algae on the rocks.
4. If you find that you're in fast flowing water up to your hips, turn sideways into the flow and move to a shallower area if it is difficult to maintain your balance.
5. You can use a long stick to help balance yourself while you wade to your desired location.

Bridge Sampling Safety

1. Do not lean on any unstable railings on the bridge.
2. While lowering the bucket down, or while pulling it up, make sure your feet are not caught in the rope!
3. Never put yourself in a dangerous situation. Use your best judgment while on the bridge. If you feel in danger, consider wading in to take a sample.
4. If there is guardrail check it for hornet nests on the backside before leaning over it.
5. Check yourself for ticks when you get back to the car.

Poison Ivy

Poison ivy is a common plant along the shores of New Hampshire's rivers and streams and along the embankments of bridges. The best way to avoid contact with poison ivy is to wear your waders when moving through an area where the plant is present.

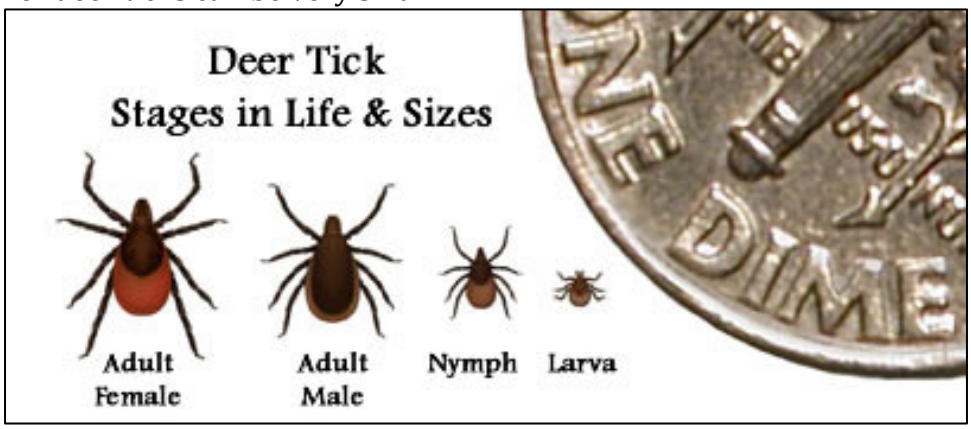
If you know you walked through poison ivy, avoid touching the your clothing or waders from the knee down to the boots. If necessary use gloves to remove your waders. If you suspect you have contacted poison ivy with your bare skin use Technu to minimize the risk of developing a rash.

Poison ivy typically has three leaflets (but it can be found with more) with an oily sheen on their surface. It grows as a climbing or low crawling vine, or independently (one stem with three leaves).

Poison ivy growing individually (can also grow as a vine)

Deer Ticks

Ticks, which can carry the Lyme disease bacterium, prefer wooded and bushy areas with high grass and abundant leaf litter. Deer ticks can be present from May through October but are more common during the warmer summer months. During spring and early summer deer ticks can be very small.



Deer ticks can transmit Lyme disease if they are attached to your body for 24 hours or more. If you find a tick latched onto you, you should remove the tick as soon as possible by using tweezers or a tick removing tool. Grab the tick by the head as close to your skin as possible and pull it up slowly and firmly. If you have a tick latched on to you it is adviseable to seek counsel from your doctor as to any additional treatments that might be needed.

To avoid ticks wear your waders when walking through dense vegetation and grassy areas. Check yourself after every trip through the tall grass.

To avoid ticks, avoid walking in tall grasses or shrubby areas. If you must, wear long pants with tall socks (preferably light colored clothing to better detect the ticks) or waders.

Quality Assurance & Quality Control

In order for VRAP data to be used to assess NH's surface water quality, the data must meet quality control guidelines. The VRAP Quality Assurance/Quality Control (QA/QC) measures include a four tiered approach to ensuring the accuracy of the equipment and consistency in sampling efforts.

1. Calibration:

- Calibrate the pH and dissolved oxygen meters prior to each measurement.
- Check the conductivity and turbidity meter against a known standard prior to the first measurement of the day.

2. Replicate Analysis

- Measure and record a second measurement by each meter from the same bucket of water at one of the stations during the sampling day.
- Replicates should be measured within 15 minutes of the original measurements. If more than one team is out sampling each team should complete a replicate analysis.
- The dissolved oxygen and pH meters should be recalibrated prior to measuring the replicate

3-5. Meter Precision Checks

At one station during the sampling day, perform meter precision checks. These measurements serve to ensure the accuracy of each meter. Meter checks include:

- **6.0 pH Standard:** Measure and record a reading of the 6.0 pH buffer. Do not calibrate the meter prior to this measurement as it is intended to detect drift in the meter. The acceptable range is 5.7 – 6.3 pH units.
- **DI (De-Ionized) Turbidity Blank**: Measure and record a reading of the DI turbidity blank (0 NTU). The acceptable range is 0 – 0.25 NTU.

6. End of the Day Conductivity & Turbidity Meter Checks

- Re-check and record a reading of the conductivity and turbidity meters against a known standard at the conclusion of each sampling day.

If the same sampling schedule is used throughout the monitoring season, the Replicate and Meter Precision Checks should be conducted at different stations over the sampling season.

Sample Collection Protocols

Pre-sample collection: Labeling Bottle

It is important that the bottles be labeled before the sample is poured into the bottle and while the sample bottle is still completely dry. It is very difficult to properly write on a wet sample bottle. Be sure to use neat and legible writing on the bottles.

Information to include on labels:

- Test(s) required (e.g. TP/TKN)
- Station ID (e.g. 01-CTC, 02-ISG-REP)
- Date (mm/dd/yy) and time (hh:mm in military time) of collection (e.g 7/12/14 14:45)
- Collectors' initials

Sampling From a Bridge

If you feel that the conditions are not safe for sampling leave the bridge immediately and skip sampling that station. The sample should be collected from the upstream side of the bridge in the center of the bridge. The exception to this is if the upstream side of the bridge has no safe place to walk but the downstream side has a sidewalk/bike path. In that case you should sample on the safer downstream side.

What you'll need:

- Bucket with rock or weight taped onto one side
- Rope and reel attached to bucket

Collect the water sample using the bucket/rope system

- Attach the end of the rope to the handle of the bucket. Lower bucket into the river from the upstream side of the bridge (water flowing toward you).

- Fill ¼ of the bucket with water.

- Pull the bucket up, swish the water around to thoroughly rinse the bucket and discard the rinsed water on the opposite side of the bridge – do not release the water to the area where you will be taking the final sample. Repeat this process 2 more times (total of **3** rinses).

- Return the bucket into the river from the upstream side of the bridge and slowly fill the bucket with water. Allow the water to flow into the bucket as slowly as possible.

- ❖ Slowly pull up the bucket with sample water. Do not bump the bucket against the bridge or otherwise agitate the sample water in the bucket as this may introduce additional oxygen and sediment thereby yielding inaccurate readings. If sample does become altered in some way, you need to dump the bucket and refill it.

- ❖ Carefully carry the sample back a safe location. Place the bucket in the shade and out of the rain if possible.

Fill Bottles for Laboratory Analysis

- ❖ Fill all labeled sample bottles completely with the water sample contained in the bucket. Use caution when opening the preserved sample bottles, as pressure may have built-up in the empty bottles during travel. The brown nutrient bottles do contain a small amount of acid to preserve the sample – do not pour this acid out.
- ❖ Be careful not to overtop bottles when filling them, particularly the brown nutrient bottles, as overtopping them could flush out the acid preservative.
- ❖ Place all filled water sample bottles on ice in the cooler as soon as possible after collection, and ensure the top of the cooler is tightly closed.

ONCE THE BOTTLES HAVE BEEN FILLED FOR LABORATORY PARAMETERS THE HANDHELD METER SHOULD BE USED TO RECORD THE FOLLOWIGN FIELD PARAMETERS USING THE PROTOCOLS IN THE NEXT SECTION

- Dissolved Oxygen (% Saturation and mg/L)
- pH
- Specific Conductance
- Turbidity
- Water Temperature

Sampling Via Wading

For wadeable streams samples can be collected by wading directly into the river. Do not wade into water that is more than waist deep. Be sure that your partner on shore knows that you are entering the water and is available to assist you if need be.

What you'll need:

- A pair of waders
- Bucket
- *E. coli* bottle (as needed)

Collect *E. coli* Sample

- Carefully wade into the river as close as possible to the center as can be done safely.
- Carefully remove the lid of the *E. coli* bottle making sure not to touch the sterile inside of the lid or the bottle. Hold the lid in one hand without touching the inside
- Facing upstream, use a "U"-shaped motion and thrust the bottle under the water's surface and fill in one continuous upstream motion away from you, turning the bottle right side-up at the bottom of the "U". In this fashion, the water will flow into the bottle, then over your hand. Fill to the neck only, leaving some air at the top of the bottle for laboratory analytical processes.
- Put cap on tight and place the bottle somewhere safe on the shore. If this is a replicate site be sure to fill a second bottle that has been labeled with "-REP" at the end of the station ID (i.e. 01-HOB-REP).
- The *E.coli* sample can also be collecting by pouring from the bucket.

Collect Sample with Bucket

- Wade back out to same spot where *E. coli* was taken. Try to minimize the amount of sediment stirred up from the bottom and chose a sampling location near the center of the stream that has not been disturbed by agitated sediment.
- Facing upstream, dip the bucket into the water and fill ¼ of the bucket. Rinse the water in the bucket and return the water to the stream behind you (downstream) with minimal disturbance of the surface of the river. Repeat this process 2 more times (total of **3** rinses).
- Facing upstream, dip the bucket into the water and fill it as slowly as possible until the bucket is ¾ full.

- ❖ Carefully carry the sample back a safe location. Place the bucket in the shade and out of the rain if possible.

Fill Bottles for Laboratory Analysis

- ❖ Fill all labeled sample bottles completely with the water sample contained in the bucket. Use caution when opening the preserved sample bottles, as pressure may have built-up in the empty bottles during travel. The brown nutrient bottles do contain a small amount of acid to preserve the sample – do not pour this acid out.
- ❖ Be careful not to overtop bottles when filling them, particularly the brown nutrient bottles as overtopping them could flush out the acid preservative.
- ❖ Place all filled water sample bottles on ice in the cooler as soon as possible after collection, and ensure the top of the cooler is tightly closed.

ONCE THE BOTTLES HAVE BEEN FILLED FOR LABORATORY PARAMETERS THE HANDHELD METER SHOULD USE TO RECORD THE FOLLOWIGN FIELD PARAMETERS USING THE PROTOCOLS IN THE NEXT SECTION

- Dissolved Oxygen (% Saturation and mg/L)
- pH
- Specific Conductance
- Turbidity
- Water Temperature

LABORATORY SAMPLES

It is important to submit laboratory samples as soon as possible to ensure they do not expire before analysis. Table 1 below provides information regarding the storage of samples and the maximum hold times.

It is helpful to remind VRAP staff when you are bringing in samples. This is helpful to the laboratory staff especially when a large number of samples are expected.

The Public Health Laboratory accepts samples until 3pm each day Monday –Thursday and until 1pm on Friday.

Analytical parameter	Sample Volume	Container Size and Type	Preservation Requirements	Maximum Holding Time
E. coli	100 mL	250 mL sterile white polyethylene	chilled to ≤ 10ºC	8 hours
Total Phosphorus (TP)	50 mL	250 mL brown polyethylene	acidified, light protected, chilled to 4°C	28 days
Chloride (Cl)	40 mL	40 mL or 250 mL white polyethylene	chilled to 4°C	28 days
Nitrate+nitrite (NO_3+NO_2)	40 mL	40 mL or 250 mL white polyethylene	chilled to 4°C	48 hours
Total Kjeldahl Nitrogen (TKN)	40 mL	250 mL light protected polyethylene	acidified, light protected, chilled to 4°C	28 days
Ammonia (NH_3)	~~20-~~50 mL	250 mL light protected polyethylene	acidified, light protected, chilled to 4°C	28 days
Chlorophyll *a*[b]	500 mL	500 mL light protected polyethylene	light protected, chilled to 4°C	24 hours
Hardness	500 mL	500 mL LDPE or HDPE	acidified, light protected, chilled to 4°C	28 days
Metals	500 mL	500 mL LDPE or HDPE	acidified, light protected, chilled to 4°C	28 days

Completing the NHDES Laboratory Services Login & Custody Sheet

The following is a guideline for completing the Laboratory Services Login & Custody Sheet which is required to be submitted along with your laboratory samples. If you can let a VRAP staff member know ahead of time we may be able to meet you at the lab and provide assistance with laboratory login if it would be helpful.

If you are bringing in chloride samples those should be dropped off at the Jody Connor Limnology Center (JCLC). When you arrive at the JCLC tell the staff person who greets you that they are VRAP chloride samples. They will place them in the refrigerator and alert a VRAP staff person that they have arrive.

All other laboratory samples need to be brought to the New Hampshire Public Health Laboratory window. This is located just around the corner from the JCLC entrance. Let the lab staff member know they are VRAP samples and they will assist you with the login and chain of custody form.

These are the key pieces of information that you need to fill out on the login form. At the end of this section is an example of a filled out lab login and custody form.

Lab Account (Billing): Use the VRAP lab account number (**05-0022518**) or your group's unique laboratory account number

One Stop Project: VRAP

Description: River or VRAP group name

Collected By: The name and phone number of the person who should be contacted if there are any questions about the samples.

Contact & Phone Number: Ted Walsh ext. 2083 if you use the VRAP account number or your own name and phone number if you use your own lab account number

Station ID: Please use the NHDES VRAP Station IDs (i.e. 02-CLD). If you have collected a replicate sample put "-REP" at the end of the station ID (i.e. 02-CLD-REP). If this is a new station without a VRAP ID use WSHEDTBD. If you have multiple new stations use the ID's WSHEDTBD1, WSHEDTBD2 for as many as needed. For these new stations it is important to write something in the Sampler Comments field that provides a unique brief description of the location (i.e. Oak St Bridge Concord, Upstream of Big Creek, Nice Pond outlet, ect.

Date/Time Sampled: Date and time of each sample collected. Use military time (i.e. 14:30)

# of Containers: Number of sample bottles per station.

Matrix: For all water samples write "AQ" for aqueous.

Parameters Sampled: In the columns to the right of the Matrix column, please fill in a box of each sample bottle. In most cases you would write one parameter pre bottle. If you are sampling for Total Phosphorus and Total Nitrogen the lab can analyze both Total Phosphorus and TKN from the brown nutrient bottle. In this case you would write TP/TKN as the parameter.

Sampler Comments: Leave blank unless this is a new station without a station ID. In that case use WSHEDTBD in the Station ID column and write a brief description in this box.

Lab Login #. Leave blank.

Relinquished By: Sign your name

Date & Time: Date and time you signed your name

Received By: Leave blank. This will be completed by Laboratory Services personnel.

Please fill in the number of pages (Example: Page 1 of 1) at the bottom of the sheet.

NHDES LABORATORY SERVICES LOGIN AND CUSTODY SHEET

(Laboratory Policy: Samples not meeting method requirements will be analyzed at the discretion of the NHDES Laboratory.)

Samples must be delivered in a cooler with ice or ice packs.

LAB ACCOUNT (Billing) 05-0022518 One Stop Project: VRAP NHDES Site Number_____

Description: _Bellamy River Town: _____ _____ Temp. ^{0} C._____23.5_____

Collected By: Volunteer's name & # Contact & Phone # ___Ted Walsh 271- 2083___

Station ID	Date & Time Sampled	# of Containers	Matrix	Total Phosphorus (TP)	E. coli					Sampler Comments	Lab Login #
05-BLM	6/11/13 9:25	2	AQ	X	X						
06-BLM	6/11/13 10:12	1	AQ	X	X						
12-BLM	6/11/13 12:45	2	AQ	X	X						
12-BLM-REP	6/11/13 13:15	2	AQ	X	X						

Relinquished By: VRAP Volunteer Date and Time: 6/11/13 16:05 Received By:_____

Relinquished By: _____Date and Time:_____ ____ **Received For Laboratory By:_____**

Matrix: A= Air S= Soil AQ= Aqueous (Ground Water, Surface Water, Drinking Water, Waste Water) ❒ Other:

Page _1_ of _1___ Data Reviewed By:_____ _____ Date:____

Section No.: 22.0
Revision No.: 6
Date:4-8-10
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VRAP FIELD DATA SHEET

The VRAP Field Data Sheet is intended to record all of your water quality measurements, QA/QC activities and other information you think would be helpful in interpreting the results and documenting the conditions you encountered.

Some items to note when filling out the field data sheet.

- Please write neatly. If you make a mistake neatly cross out the incorrect information and make edits as needed.
- Be sure to do a replicate sample for each sampling day
- Complete of the needed QA/QC checks including pre-sampling checks, calibrations, meter precision checks, and end of the day meter checks.
- On the back of the data sheet there is space to provide any information that would be helpful to us as we review that data and interpret the results.
- On the back of the form please fill the appropriate information regarding laboratory samples you have collected.

A blank datasheet is provided at the end of this document. It is helpful to VRAP staff to receive the data sheets soon after the data is collected. This allows us to review the data and assist with any problems you may had with the meters. It also allows DES to detect any water quality concerns that need immediate attention.

VRAP Field Data Sheets can be mailed to:

NH Volunteer River Assessment Program
NH Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive PO Box 95
Concord, NH 03302-0095

They can also be e-mailed as PDF to ted.walsh@des.nh.gov or faxed to (603) 271-7894.

VRAP FIELD SAMPLING SELF-ASSESSMENT FORM

During each sampling day VRAP volunteers should fill out and submit the VRAP Field Sampling Self-Assessment Form with the Field Data Sheet. This self-assessment is a check list to assist volunteers in ensuring that high quality data is collected and that the water quality meters are used correctly. Volunteers should check off the necessary tasks as they are completed throughout the sampling day. There is space available for comments if you want to alert DES staff of any issues you encountered had while sampling. A copy of the Field Sampling Self-Assessment From is included at the end of this document.

WATER QUALITY MONITORING EQUIPMENT STANDARD OPERATING PROCEDURES (SOPs)

This section of the VRAP protocols is intended to be a step-by-step guide as to how to properly operate the water quality monitoring equipment and conduct all of the necessary QA/QC procedures. NHDES provides equipment so some VRAP groups and in some cases groups have purchased their own equipment. These SOPs include all of the types of equipment NHDES provides and almost all of the meters used by VRAP groups with their own equipment. If your group uses a meter that is not included in these protocols VRAP staff can assist you in developing a SOP.

Regardless of the type of meter that is being used the QA/QC procedures should be followed for each parameter and each meter used.

General Tips

- Be sure to store the meters in a location that is dry and safe from extreme temperatures. The meters cannot be stored long-term in an unheated location in the winter.
- It is helpful to use a toolbox or similar waterproof container to store meters that do not come with their own cases, and all of the solutions and supplies needed to conduct VRAP monitoring.
- Always carry a set of spare batteries for each meter.
- When sampling is completed be sure to dry off the meters before putting them back in their storage cases.

If during your sampling day one of the meters malfunctions and you are not able to get it working properly you can still continue monitoring. Make a note on the Field Data Sheet that you were not able to measure a given parameter because of a malfunctioning meter and continue using the other meters.

Water Temperature, Dissolved Oxygen & Specific Conductance

YSI 85 Meter

Check the Dissolved Oxygen Membrane and Calibration Chamber

Ensure the dissolved oxygen membrane remains moist inside storage chamber by adding a few drops of DI water to the sponge at the bottom of the chamber. Turn the meter on its side to allow any excess water to drain out of the chamber. Calibrate the meter after it has been on for 15 minutes.

WAIT! Before calibrating the dissolved oxygen, make sure the meter has been turned on for at least 15 minutes.

Calibrate the Meter for Dissolved Oxygen

Note: The Dissolved Oxygen/Temperature meter must be calibrated prior to each Dissolved Oxygen measurement (each station), including the replicate.

1. Record the time of the first dissolved oxygen calibration on the upper right front page of the VRAP Field Data Sheet.

2. Press the MODE button until the meter is in the dissolved oxygen percent saturation mode, as indicated by a '%' on the right side of the screen.

3. Press and release both the DOWN and UP arrow buttons simultaneously. You will see CAL in the lower left hand corner when you have successfully entered calibration mode.

4. The screen will prompt you to enter the local altitude in hundreds of feet. Use the UP and DOWN arrows to adjust the value appropriately (for example, entering a 12 indicates 1200 feet above sea level) and press ENTER. If you are unsure of the altitudes of your monitoring station contact your group's monitoring coordinator or VRAP staff.

5. Record the dissolved oxygen calibration value that is displayed on the bottom right-corner of the screen on the VRAP Field Data Sheet under the column "Dissolved Oxygen Calibration Value". The calibration value will vary with altitude and thus may be different at each station if the altitude varies.

6. Press ENTER again. The display should briefly display SAVE and then return to dissolved oxygen % measurement mode.

7. Wait approximately one minute for dissolved oxygen % saturation to stabilize and then record the dissolved oxygen % saturation reading on the VRAP Field Data Sheet in the column "Dissolved Oxygen % Saturation Chamber Reading". If drift occurs (goes up or down by more than 5%) ensure you have waited long enough for the reading to stabilize. If drift still occurs, recalibrate.

Perform & Record the Initial Conductivity Check Value

1. Press MODE until the flashing **°C** appears on the lower right side of the screen. This is the temperature compensated specific conductance mode.

2. Rinse the probe with DI water and gently shake the probe to remove water from the oval upper conductivity opening.

3. Submerge the entire probe in the 2,000 µS conductivity standard solution.

4. Record the **"Initial Conductivity Meter Check Value"** on the top left of the VRAP Field Data Sheet. A 20% error regardless of the standard used (1,600 – 2,400µS for 2,000µS standard, 160-240µS for 200µS standard or 80µS - 120µS for 100µS standard) is acceptable. If the reading is outside of this range, please contact VRAP staff as soon as possible. You can continue to use the meter as the incorrect reading is most likely due to contaminated standard.

5. Rinse the probe with DI water and gently shake the probe to remove water from the oval upper conductivity opening. Return it to the storage chamber

Measuring Water Temperature. Dissolved Oxygen, and Specific Conductance

Note: This meter should remain on until the last station has been sampled. If the meter is turned off prior to the end of the sampling day, the meter must be turned on and allowed a 15-minute warm-up period, with the probe in its chamber, prior to calibration and additional sampling. Remember, the dissolved oxygen/temperature meter must be **calibrated prior to each dissolved oxygen measurement including the replicate**.

1. Remove the probe from the calibration chamber and rinse the probe with DI water. If necessary, press the MODE button until dissolved oxygen is displayed in % saturation.

2. Immerse the probe into the bucket ensuring the holes at the top of the probe are underwater. Slowly move the probe back and forth in the sample until the water temperature stabilizes. Do not allow the probe to touch the side or bottom

of the bucket while you are taking readings. Record the water temperature (°C) on the VRAP Field Data Sheet.

3. After the water temperature has stabilized, wait for the dissolved oxygen (% saturation) to stabilize. Once it is stable, record the value on the VRAP Field Data Sheet.

4. Press the MODE button and immediately record the value for dissolved oxygen concentration (mg/L) on the VRAP Field Data Sheet.

5. Press the MODE button twice to put the meter into the temperature compensated specific conductance mode, as indicated by the flashing °C and the uS/cm units. Record the specific conductance value on the VRAP Field Data Sheet.

6. If you are sampling under very cold conditions (<2°C.) you will get an error message. Press the MODE button until you are in the screen the solid non-flashing °C and uS/cm as the units. This is actual conductance. It can be converted to specific conductance by DES staff as long as water temperature is also measured. Please make a note on the Field Data Sheet if you need to measure actual conductance.

Perform & Record the End of the Day Conductivity Value

This is done after you have finished sampling at the last station of the day.

1. Press MODE until the flashing **°C** appears on the lower right side of the screen. This is the temperature compensated specific conductance mode.

2. Rinse the probe with DI water and gently shake the probe to remove water from the oval upper conductivity opening.

3. Submerge the entire probe in the 2,000 µS conductivity standard solution.

4. Record the specific conductance value at the bottom the Field Data Sheet in the section "End of Day Meter Checks".

5. Rinse the probe with DI water and gently shake the probe to remove water from the oval upper conductivity opening and return it to the storage chamber. Turn the meter off.

Water Temperature, Dissolved Oxygen & Specific Conductance

YSI Pro 2030

Check the Dissolved Oxygen Membrane and Calibration Chamber

Ensure the dissolved oxygen membrane remains moist inside grey rubber storage chamber by adding a few drops of DI water to the sponge at the bottom of the chamber. Pour off excess water. Calibrate the meter after 15 minutes.

WAIT! Before calibrating the dissolved oxygen, make sure the meter has been turned on for at least 15 minutes.

Calibrate the Meter for Dissolved Oxygen

Note: The Dissolved Oxygen/Temperature meter must be calibrated prior to each Dissolved Oxygen measurement (each station), including the replicate.

1. Record the time of the first dissolved oxygen calibration on the upper right front page of the VRAP Field Data Sheet.

2. Press and hold the Cal key for 3 seconds.

3. Scroll with the arrow keys to highlight "Dissolved Oxygen" and press ENTER to calibrate.

4. Select DO% when prompted then press ENTER.

5. The screen will show a % Saturation reading and below that a % Calibration.

6. On the Field Data Sheet under the column "Dissolved Oxygen Calibration Value" record the calibration value 'Cal Value' from the display screen. The calibration value will vary with altitude and thus may be different at each station if the altitude varies. This is the small number in the low portion of the screen - not the larger number displayed in the center of the screen.

7. Wait about 15 seconds for the meter to stabilize and then press ENTER.

8. 'Calibration Successful' will be displayed briefly and then the instrument will return to the main screen. If 'Unsuccessful Calibration' is displayed, wait two minutes then repeat the calibration.

9. Wait approximately one minute for dissolved oxygen % saturation to stabilize and then record the dissolved oxygen % saturation reading on the VRAP Field Data Sheet in the column "Dissolved Oxygen % Saturation Chamber Reading". If

drift occurs (goes up or down by more than 5%) ensure you have waited long enough for the reading to stabilize. If drift still occurs, recalibrate.

Perform & Record the Initial Conductivity Check Value

1. Rinse the probe with DI water and gently shake the probe to remove water from the conductivity sensors.

2. Submerge the entire probe in the 2,000 µS conductivity standard solution.

3. Record the **"Initial Conductivity Meter Check Value"** on the top left of the VRAP Field Data Sheet. A 20% error regardless of the standard used (1,600 – 2,400µS for 2,000µS standard, 160-240µS for 200µS standard or 80µS - 120µS for 100µS standard) is acceptable. If the reading is outside of this range, please contact VRAP staff as soon as possible. You can continue to use the meter as the incorrect reading is most likely due to contaminated standard.

4. Rinse the probe with DI water and gently shake the probe to remove water from the conductivity sensors.

Measuring Water Temperature, Dissolved Oxygen, and Specific Conductance

Note: This meter should remain on until the last station has been sampled. If the meter is turned off prior to the end of the sampling day, the meter must be turned on and allowed a 15-minute warm-up period, with the probe in its chamber, prior to calibration and additional sampling. Remember, the dissolved oxygen/temperature meter must be **calibrated prior to each dissolved oxygen measurement**.

1. Remove the probe from the calibration chamber and rinse the probe with DI water.

2. Immerse the probe into the bucket ensuring the holes at the top of the probe are underwater. Slowly move the probe back and forth in the sample until the water temperature stabilizes. Do not allow the probe to touch the side or bottom of the bucket while you are taking readings.

3. Record the water temperature (°C), Dissolved Oxygen (mg/L and %Sat), and Specific Conductance (uS/cm) on the VRAP Field Data Sheet.

Perform & Record the End of the Day Conductivity Value

This is done after you have finished sampling at the last station of the day.

1. Rinse the probe with DI water and gently shake the probe to remove excess water.

2. Submerge the entire probe in the 2,000 μS conductivity standard solution.

3. Record the specific conductance value at the bottom the Field Data Sheet in the section ”End of Day Meter Checks”.

4. Rinse the probe with DI water and gently shake the probe to remove excess water. Return it to the storage chamber and turn the meter off.

pH
Oakton pH 11 Meter

Two Point pH Calibration

The pH meter must be calibrated prior to each measurement (at each station) including the replicate.

Be sure to never touch the glass bulb on the bottom - even with a Kimwipe.

Never store the pH probe in DI water.

1. Unscrew the cap of the electrode storage container and remove the end of the pH probe - the screw cap can remain on the electrode. Slide the screw cap a few inches up the probe. Rinse the probe with DI water. Blot dry with a Kimwipe.

2. Press the ON/OFF button to turn the meter on. The MEAS (measure mode) indicator should be displayed on the screen.

3. Press the CAL/MEAS button to enter pH calibration mode. The CAL (calibration mode) indicator should be displayed on the screen. The primary display will show the measured reading while the smaller secondary display will indicate the pH standard buffer solution - the meter will recognize the pH buffer.

4. Immerse the probe into the 7.0 pH buffer (yellow solution).

5. Wait for the measured pH value to stabilize and the READY indicator to appear on the display. The READY indicator may flash on and off so wait until it is steady to achieve an accurate calibration.

6. Press the HOLD/ENTER key to confirm calibration.

7. Remove the electrode from the 7.0 buffer, rinse it with DI water and blot dry with a Kimwipe.

8. Place the electrode in the 4.0 pH buffer (red solution).

9. Wait for the measured pH value to stabilize and the READY indicator to appear on the display. The READY indicator may flash on and off so wait until it is steady to achieve an accurate calibration.

10. Press **HOLD/ENTER** button to confirm calibration.

11. The meter should automatically switch to the MEASURE mode. If it does not press the CAL/MEAS button to return the meter to MEASURE mode. Remove the electrode from the 4.0 buffer, rinse it with DI water and blot dry with a Kimwipe.

12. View pH Electrode Slope:

    a. Press the SETUP button.

    b. Press the MI/UP two times until you view "ELE P 3.0"

    c. Press the HOLD/ENTER button twice. The display shows the electrode slope in %.

13. Record the slope on the VRAP Field Data Sheet under the column "pH Calibration Slope". The slope should be between 95 – 105%. If the slope is out of range you can continue measuring pH for the sampling day but please let DES staff know as soon as possible so we can replace the probe.

14. To return to measurement mode press the CAL/MEAS button twice. The MEAS (measure mode) indicator should be displayed on the screen.

Measuring pH

1. Remove the probe, rinse with DI water and blot the plastic areas dry with a Kimwipe. Make sure the meter is in measurement mode as indicated by MEAS on the display.

2. Immerse the pH probe into the sample container. Agitate the sample by slowly moving the electrode back and forth in the sample.

3. When a stable reading is achieved the READY indicator to be displayed. It is common for the READY indicated to blink on and off while the reading stabilizes. The measurement tends to start low and then drift upwards. Wait until the reading has stopped drifting. Record the value on the VRAP Field Data Sheet.

4. **Rinse** the probe with DI water and return it to the electrode solution storage container. Ensure the electrode storage container is filled halfway with pH storage solution.

5. Turn the meter off and return the meter and the probe to its carrying case.

QA/QC Meter Check

At one of the stations during the sampling day measure and record a reading of the 6.0 pH buffer. You do not need to recalibrate the meter before you take this reading. Record the value, station ID, and time in the data sheets "QA/QC Meter Check" box.

Turbidity
LaMotte 2020

Initial Turbidity Check Value

1, Turn the meter on by pressing the READ button. A triangle should be displayed in the upper left corner of the display screen.

2. Find the glass vial with the 1.0 NTU standard and carefully wipe off any water, dust and/or fingerprints from the vial with a Kimwipe only.

3. Open the lid of the meter and align the etched arrow on the glass vial with the arrow under the meter lid. Insert the vial into the chamber and close the lid.

4. Press the READ button.

5. Record the reading on the top left of the VRAP Field Data Sheet as the "Initial Turbidity Meter Check Value". If the displayed value reads 1.0 calibration is unnecessary.

Calibration

The turbidimeter needs to be calibrated once prior to the first measurement and checked once after the last measurement at the end of the day.

1. If the displayed reading of the 1.0 NTU standard is not exactly 1.0 the press and hold the CAL button until you see CAL displayed on the screen – this should take about 3 seconds. Release the button. The display will flash.

2. Adjust the value with the up and down arrows until the value of the standard (1.00) is displayed.

3. Push the CAL button again to complete calibration.

Measuring Turbidity

1. Rinse the sample vial once with DI water and then twice with river water from the bucket container.

2. Fill the sample vial with river water by carefully and slowly pouring the water down the side of the sample vial to avoid introducing any bubbles.

3. Wipe any water, dust and/or fingerprints off the sample vial with a Kimwipe.

4. Open the lid of the turbidimeter and align the etched arrow on the cleaned sample vial with the arrow under the turbidimeter lid.

5. Close the lid. Press READ.

6. Record the displayed turbidity reading on the VRAP Field Data Sheet.

7. If the turbidity value is great than 10 NTU you should recalibrate the meter with the 10 NTU standard and take another reading. This will give a more accurate measurement of how high the turbidity level is. If you do recalibrate with the 10 NTU standard, be sure to indicate this under the "Comments" section on the back the VRAP Field Data Sheet. **Recalibrate with the 1.0 NTU at the next station to prevent the readings from being artificially elevated.**

8. Turn the meter off by holding the READ button down**.**

QA/QC Meter Check

At one of the stations during the sampling day measure and record a reading of the DI Turbidity Blank (0.0 NTU) standard. If the same sampling schedule is used throughout the monitoring season, the DI turbidity blank check should be conducted at different stations. Record the value, station ID, and time in the data sheets "QA/QC Meter Check" box.

End of the Day Meter Check

Read the 1.0 standard and record the value under the "End of Day Meter Check" on the VRAP Field Data Sheet.

Turbidity
LaMotte 2020e

Initial Turbidity Check Value

1, Press ON to turn the meter on.

2. The asterisk should be just to the left of "Measure". Press the OK button.

3. The asterisk will now be to the left of "Scan Blank". You will get a more accurate measurement if you always scan the blank before taking an actual measurement. Remove the DI/Blank glass vial and carefully wipe off any water, dust and/or fingerprints from the vial with a Kimwipe. Place the DI/Blank glass vial in the turbidimeter with the vertical white line in front of the triangle on the meter. Press OK.

4. The asterisk will now be to the left of "Scan Sample". Remove the DI/Blank glass vial and located the 1.0 NTU glass vial – carefully wipe off any water, dust and/or fingerprints from the vial with a Kimwipe. Open the lid of the meter and align the etched arrow on the "1.0 NTU" vial with the arrow under the meter lid. Insert the vial into the chamber and close the lid. Press OK.

5. Record the reading on the top left of the VRAP Field Data Sheet as the "Initial Turbidity Meter Check Value**".** If the displayed value is the same as the 1.0 NTU Standard, calibration is unnecessary.

Calibration

The turbidimeter needs to be calibrated once prior to the first measurement and checked once after the last measurement at the end of the day.

1. If the displayed reading of the 1.0 NTU standard is not exactly 1.0 then the meter should be calibrated. Press the down arrow once and you will see the asterisk displayed to the left of "Calibrate". Press the OK button.

2. The number on the left will be highlighted. You can use the up and down arrows to make adjustments to the number that is highlighted. Once the highlighted number is correct press OK and the highlight will move to the next number on the right. If you are calibrating to a 1.0 NTU standard the display should read "01.00".

3. Once the number on the far right is correct you will see the asterisk to the left of "Set". If the displayed calibration value is correct press OK. The meter will now be back in the main measurement display.

Measuring Turbidity

1. Rinse the sample vial once with DI water and then twice with river water from the bucket container.

2. Fill the sample vial with river water by carefully and slowly pouring the water down the side of the sample vial to avoid introducing any bubbles.

3. Wipe any water, dust and/or fingerprints off the sample vial with a Kimwipe.

5. The asterisk should be just to the left of "Measure". Press the OK button.

6. The asterisk will be to the left of "Scan Blank". Remove the DI/Blank glass vial and carefully wipe off any water, dust and/or fingerprints from the vial with a Kimwipe. Place the DI/Blank glass vial in the turbidimeter with the vertical white line in front of the triangle on the meter. Press OK.

7. The asterisk will now be to the left of "Scan Sample". Remove the DI/Blank glass vial and place the Sample glass vial into the meter. Close the lid. Press OK.

9. Record the displayed turbidity reading on the VRAP Field Data Sheet.

10. If the turbidity value is great than 10 NTU you should recalibrate the meter with the 10 NTU standard and take another reading. This will give a more accurate measurement of how high the turbidity level is. If you do recalibrate with the 10 NTU standard, be sure to indicate this under the "Comments" section on the back the VRAP Field Data Sheet. **Recalibrate with the 1.0 NTU at the next station to prevent the readings from being artificially elevated.**

QA/QC Meter Check

At one of the stations during the sampling day measure and record a reading of the DI Turbidity Blank (0.0 NTU) standard. If the same sampling schedule is used throughout the monitoring season, the DI turbidity blank check should be conducted at different stations. Record the value, station ID, and time in the data sheets "QA/QC Meter Check" box. You do not need to "Scan Blank" when doing this step. You can press the down arrow to move straight to "Scan Sample".

End of the Day Meter Check

Read the 1.0 standard and record the value under the "End of Day Meter Check" on the VRAP Field Data Sheet.

Turbidity
LaMotte 2020we

Initial Turbidity Check Value

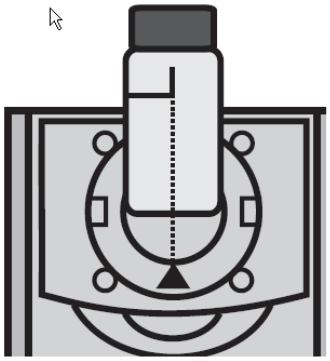
1. Press and briefly hold the power button to turn the meter on.

2. In main menu select 'Measure' by pressing the ENTER button.

3. Scroll down using the to the setting that reads 'Turbidity- With Blank' and press ENTER.

4. Carefully wipe off any water, dust and/or fingerprints from the "DI Blank" (0.0 NTU) vial with a Kimwipe only.

5. Open the lid of the meter and align the vertical white line located on the glass vial with the arrow under the meter lid



6. Close the lid. Select 'Scan Blank' by pressing ENTER. After a few seconds the meter will switch to 'Scan Sample' being the highlighted option

7. Remove the DI Blank vial and return it to the meter case.

8. Carefully wipe off any water, dust and/or fingerprints from the 1.0 NTU vial with a Kimwipe.

9. Open the lid of the meter and align the vertical white line located on the 1.0 NTU vial with the arrow under the meter lid.

10. Insert the vial into the chamber. Close lid. Select 'Scan Sample' by pressing ENTER.

11. Record the value on the Field Data Sheet in the calibration box under "Initial 1.0 NTU Reading". If the value is "1.00" you do not need to calibrate.

Calibration

Note: The turbidimeter needs to be calibrated once prior to the first measurement and checked once after the last measurement at the end of the day.

2. Acquire the 1.0 NTU standard and clean the outside of the vial with a Kimwipe. Insert the 1.0 NTU standard into the chamber and close the lid. Push the **CAL** button until **CAL** is displayed. This should take around 5 seconds. Release the button. The display will flash.

3. Adjust the value with the up and down buttons until the value of the standard is displayed.

4. Push the **ENTER** button again to complete calibration.

Measuring Turbidity

4. **Rinse** the sample vial once with DI water and then twice with river water from the bucket container.

5. Fill the sample vial with river water by carefully and slowly pouring the water down the side of the sample vial to avoid introducing any bubbles.

6. Wipe any water, dust and/or fingerprints off the sample vial with a Kimwipe.

7. If the meter is off, turn it on by pressing **READ**.

8. Open the lid of the turbidimeter and align the etched arrow on the cleaned sample vial with the arrow under the turbidimeter lid.

9. Close the lid. Press **READ**.

10. **Record** the displayed turbidity reading on the VRAP Field Data Sheet.

11. If the turbidity value is great than 10 NTU you should recalibrate the meter with the 10 NTU standard and take another reading. This will give a more accurate measurement of how high the turbidity level is. If you do recalibrate with the 10 NTU standard, be sure to indicate this under the "Comments" section on the back the VRAP Field Data Sheet. **Recalibrate with the 1.0 NTU at the next station to prevent the readings from being artificially elevated.**

12. Turn the meter **OFF** by holding the **READ** button down until the screen reads **OFF.**

QA/QC Meter Check

1. At one of the stations during the sampling day measure and record a reading of the DI Turbidity Blank (0.0 NTU) standard. If the same sampling schedule is used throughout the monitoring season, the DI turbidity blank check should be conducted at different stations.

2. **Record** the value, station, and time on the VRAP Field Data Sheet.

End of the Day Meter Check

1. Read the 1.0 standard and record the value under the **"End of Day Meter Check"** on the VRAP Field Data Sheet.

NH Volunteer River Assessment Program
2014 Field Data Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Date Entered: _____ By: _____

Date Proofed: _____By: _____

Date OA/OC: By:

VRAP Group: _____Date: _____/____/2014 Start Time: _____End Time: _____

Volunteer Monitors *(First & Last Names):* _____

Initial Turbidity Meter Check Value: _____

Initial Conductivity Meter Check Value:_____
(+/- 20% - 2,000 std: 1,600–2,400 µS)

Time Dissolved Oxygen Meter Turned On: _____

Time of 1st Dissolved Oxygen Calibration: _____

NHDES Station ID	**Station Name Or Description**	**Time Sampled** (HHMM)	**Turbidity** (NTU)	**pH Calibration Slope** (92-102%)	**pH** (Units)	**Dissolved Oxygen Calibration Value**	**Dissolved Oxygen** (% saturation chamber reading)	**Water Temp** (ºC)	**Dissolved Oxygen** (% Sat)	**Dissolved Oxygen** (mg/L)	**Specific Conductance** (µS)
REPLICATE											

QA/QC METER CHECK

Station:_____ Time:_____

6.0 pH Buffer Reading (5.8 – 6.3) _____ DI Turbidity Blank Reading: _____

END OF DAY METER CHECK

Conductivity (2,000 uS std.): _____ Turbidity (1.0 std.): _____

Did you collect **Laboratory Samples** today? ☐ Yes ☐ No If yes, **which lab** was used? ☐ NHDES ☐ PSU ☐ UNH ☐ Other **Please elaborate on the back,**

Please elaborate on the back,

Weather Conditions:

Weather: □ Clear □ Cloudy w/o Rain □ Cloudy w/Intermittent Rain □ Cloudy w/Rain □ Rain in Past 3 Days □ Snow □ Snowmelt

Air Temperature (ºF): □ Below 30 □ 30s □ 40s □ 50s □ 60s □ 70s □ 80s □ 90s □ Calm □ Breeze □ Wind

Comments: *(Water level, Color, Odor, Observed Use)* Please indicate NHDES Station ID.

Laboratory Samples: *(Please indicate parameters taken (if any) at each station. If the same parameter was taken at each location indicate 'all' in the station ID)*

		Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Station ID	**# of Bottles**					

End of Day Checklist: *(Check if Completed)*

All Meters:

Dry and powered off _____

Turbidity:

Rinse sample vial and fill with DI water _____

pH:

Rinse probe with DI water and blot dry _____
Return probe to storage solution _____

Dissolved Oxygen:

Rinse probe with DI water _____
Return probe in chamber w/ wet sponge _____

Specific Conductance:

Rinse probe with DI water _____
Return probe to chamber _____

Equipment Kit:

Remove used Kimwipes _____
Clean off dirt, dust and moisture _____

Please return data sheets to: Ted Walsh
NH Volunteer River Assessment Program
29 Hazen Drive – PO Box 95
Concord, NH 03302-0095
p - (603) 271-2083 f – (603) 271-7894

NH VOLUNTEER RIVER ASSESSMENT PROGRAM
2013 VOLUNTEER MONITOR FIELD SAMPLING SELF ASSESSMENT

(TO BE COMPLETED BY THE VOLUNTEER AND TO BE FILED WITH ORIGINAL FIELD DATA SHEET)

VRAP Group: _____ Date: _____ Time: _____

Volunteer Monitors (First and Last Names): _____

1. Sampling Procedures	Task Completed	Comments
Sample Collection		
Sample bucket rinsed three times with river water prior to sample collection – filled upstream and poured out downstream		
Sample collected with minimal disturbance		
Laboratory Sample Collection & Transportation		
Laboratory sample bottles labeled with NHDES Station ID, date, time, analytical parameter, and volunteer's initials		
Sample volumes poured from bucket into laboratory sample bottles prior to recording field measurements		
Sample(s) stored and transported to laboratory on ice		
Beginning & End of Day Meter Checks		
Initial Meter Check/Calibration performed and recorded on field data sheet		
End of Day Meter Checks performed and recorded on field data sheet		
Field Replicate		
Field replicate measured and recorded on field data sheet		
QA/QC Meter Checks		
QA/QC Meter Checks for each meter performed and recorded on field data sheet		
Completing the Field Data Sheet & Laboratory Services Log-In Sheet		
NHDES Station ID and Station Names recorded on field data sheet		
NHDES Laboratory Services Log-In Custody Sheet completed with correct NHDES Station IDs		
2. Individual Meter Sampling Procedures	**Task Completed**	**Comments**
Turbidity ☐ *LaMotte 2020* ☐ *LaMotte 2020e* ☐ *LaMotte 2020we*		
Inside of sample vial ("S") rinsed with DI water three times with DI water before filling with sample		
Outside of vial blotted dry with a Kimwipe prior to insertion in meter		
Sample vial ("S") appropriately inserted into meter (etched arrow or notch matches with arrow on meter)		
"Initial Turbidity Meter Check Value"/calibration performed and recorded on field data sheet using appropriate standard *(1 NTU)*		
QA/QC Meter Check (DI Turbidity Blank) performed and recorded on the field data sheet		
End of Day Meter Check" performed and recorded on field data sheet using appropriate standard *(1 NTU)*		

	Task Completed	Comments
pH ☐ *Oakton pH 11* **OR** ☐ *Other*_____		
Meter calibrated to pH 7.0 and 4.0 buffers before each measurement		
Electrode probe rinsed with DI water and blotted dry with a Kimwipe after removal from each buffer and prior to sampling		
Slope calculation within limit *(92-102%)* and recorded on field data sheet		
Slow agitation of electrode probe in small sample container		
pH measurement properly recorded after READY indicator is displayed and reading has stabilized		
Electrode probe rinsed with DI water and blotted dry after removal from sample		
QA/QC Meter Check (pH 6.0) performed and recorded on field data sheet		
Dissolved Oxygen ☐ *YSI 85* **OR** ☐ *Other*_____		
Probe inspected prior to use; sensor probe free of air bubbles or tears; calibration sponge sufficiently moistened		
Meter turned **ON** at least 15 minutes prior to first calibration. Time the meter is turned on and time of first calibration recorded on datasheet		
Meter kept turned on until the end of the day		
Meter properly calibrated to % saturation relative to station elevation *(100^{ft} of feet)* before each measurement.		
Dissolved oxygen calibration value and % saturation chamber reading recorded on field data sheet.		
Probe rinsed with DI water and blotted dry with a Kimwipe prior to sampling		
Slow agitation of probe in sample		
Dissolved oxygen (% saturation and mg/L) and water temperature stabilization allowed during agitation, and recorded on field data sheet		
Specific Conductance ☐ *YSI 85* ***OR*** ☐ *Other*_____		
Temperature is a Flashing °C indicating specific conductance		
Probe rinsed with DI water and blotted dry with a Kimwipe prior to sampling		
Initial conductivity meter check recorded on data sheet		
Probe rinsed with DI water and blotted dry after removal from standard and after removal from sample		
End of Day Meter Check performed and recorded on field data sheet		
3. Data Submittal	**Task Completed**	**Comments**
Field data sheet(s) submitted to NHDES		
VRAP staff contacted regarding any issues		
Verify that the correct NHDES Station ID were used – this is critical for lab samples		

Please submit this self-assessment form with your field data sheets

NH Volunteer River Assessment Program
PO Box 95
Concord, NH 03302-0095
(603) 271-2083